(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 July 2001 (12.07.2001)

PCT

(10) International Publication Number
WO 01/49349 A1

(51) International Patent Classification[7]: A61M 11/00, 15/00, 15/08, 16/00, 16/10, A62B 18/10, B05D 7/14, B65D 83/06

(21) International Application Number: PCT/US01/00522

(22) International Filing Date: 8 January 2001 (08.01.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/174,757 6 January 2000 (06.01.2000) US

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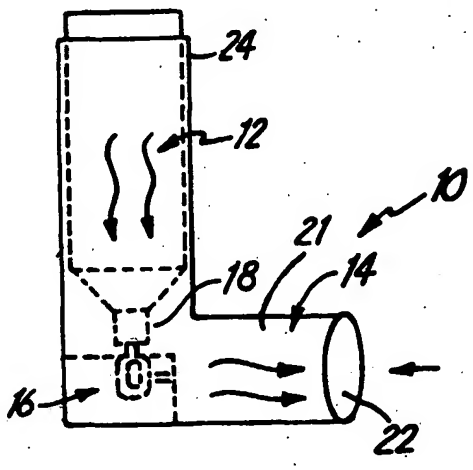
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: OXYGEN DELIVERY APPARATUS



(57) Abstract: The present invention provides a hand-held device (10) capable of delivering a flow of oxygen to its user. One embodiment of the present invention comprises a canister (12) adapted to releaseably store pressurized oxygen, a mouthpiece (14), and a valve (16) operably connected to the canister (12) and to the mouthpiece (14). The valve (16) in this embodiment selectively permits oxygen to flow from the canister (12) to the mouthpiece (14). The canister (12) in this embodiment can be removed from the mouthpiece (14) and replaced.

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TITLE: Oxygen Delivery Apparatus

FIELD OF THE INVENTION

This invention pertains to a portable oxygen delivery apparatus. More particularly, the present invention relates to a hand-held inhaler having a pressurized oxygen canister.

BACKGROUND

The tissue cells of the average adult normally utilizes around 250 cc of oxygen per minute, and the venous blood maintains a normal saturation level of 70 to 75 percent oxygen under ordinary circumstances. The human body requires the oxygen to convert sugars from food into energy. Many people can benefit from breathing pure oxygen or enhanced oxygen-level air. As more baby boomers reach middle age, fitness and health trends continue to increase in popularity. According to the National Center for Health Statistics, the fitness and health industry makes up "approximately 16.5 billion dollars in retail and service sales to the national economy." Individuals engaging in regular and periodic workouts and athletes need increased oxygen to recover from strenuous exercise or to enhance their performance during their exertions. Participants in high altitude sports as skiing, snowboarding, hiking, mountain climbing, and the like gain particular benefits from an increased oxygen supply.

Other individuals may use extra oxygen to increase their mental alertness, such as long distance drivers, business travelers, airline pilots, office workers, and other non-professionals working monotonous, high risk jobs. According to the Bureau of Labor Statistics, truck drivers will add 325,000 new jobs over the next seven years to the national job market. This will mean a greater number of drivers, and greater competition. In turn, consumers will require faster, more economical shipping. Greater demands will be placed on the drivers to perform with

fewer delays. Drivers may be required to drive further and for longer periods of time to keep up with the demands of the market. Currently, fatigue is the number one hazard for over-the-road truck drivers.

Others who might benefit from an oxygen enriched environment are smokers, victims of second hand smoke, seniors, and the like. Individuals suffering from hangovers and headaches may also benefit. Studies have shown that low blood oxygen levels are related to decreased night vision, fatigue, forced concentration, headaches, forgetfulness, incompetence, and indifference.

One problem with conventional oxygen delivery devices, however, is that they are large and heavy and not readily or conveniently available. This drawback makes them unattractive to many users, particularly athletes and others, wishing to quickly obtain the non-medicinal benefits of oxygen at irregular times. Another problem with conventional oxygen delivery devices is that they required a relatively expensive storage tank and a complex valve system.

Accordingly, there is a need for a small, lightweight, consumer oriented, easily transportable oxygen delivery apparatus that can deliver oxygen on demand. There is also a need for an inexpensive, user-friendly valve system that can be actuated simply and quickly.

SUMMARY OF THE INVENTION

The present invention provides a portable and transportable, e.g., hand-held, device capable of delivering a flow of oxygen to its user. The invention comprises two principal elements: 1) a pressurized oxygen canister, and 2) a mouthpiece. The canister is charged with a mixture of oxygen and propellant that is suitable for human consumption through the mouth. The canister is placed in the mouthpiece and may be activated by depressing the oxygen

canister into the mouthpiece. The mouthpiece is generally placed into the mouth of the user to dispense the pressurized oxygen and propellant as desired. When depleted, the oxygen canister may be discarded and replaced with a new canister in the same mouthpiece.

The oxygen canister has a structure capable of containing a pressurized medium with a valve at one end, the valve being activated by depressing the canister as described above. The mouthpiece is constructed of plastic materials sufficient for continued use, protection of the oxygen container, and dispensing of oxygen and propellant into the user's mouth as previously described.

In some embodiments, the present invention delivers quick or short breaths of pure oxygen or highly concentrated oxygenized air that could be used during exercise or anytime that a user wanted to supplement their oxygen supply. Or, the amounts delivered could be continuous or controlled by the duration of the manual manipulation of the valve. This product may be entirely disposable, may have a "refillable" canister, or may have a "reusable" mouthpiece/valve assembly that can operably attach to replacement canisters. In operation, the user would first place their mouth, nose, or both, over or into a mouthpiece or a small nose cover. The user would then squeeze the container, or manually depress it or push it in, thereby actuating a valve that starts the flow of oxygen.

One embodiment of the present invention comprises a portable hand-held canister adapted to releaseably store pressurized oxygen, a mouthpiece, and a valve operably connected to the canister and to the mouthpiece. The valve selectively permits oxygen to flow from the canister to the mouthpiece. Some embodiments may further comprise a removable

mask operably attached to the mouthpiece. This mask is designed to substantially cover the user's mouth and nose.

The present invention offers many advantages over known portable oxygen delivery devices. For example, the present invention is lightweight and easy for users to carry. Also, the present invention can be disguised as, or built into, other devices commonly carried by its users.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is a side plan view of one embodiment of an oxygen delivery apparatus.

Figure 1B is a front plan view of the embodiment in Figure 1A.

Figure 2A is a side plan view of a oxygen delivery apparatus embodiment, having a mouthpiece.

Figure 2B is a front plan view of the embodiment in Figure 1B.

Figure 3A is a side plan view of a oxygen delivery apparatus embodiment, having a generally cylindrical outer shape.

Figure 3B is a front plan view of the embodiment in Figure 3A.

Figure 4 is an expanded side plan view of a oxygen delivery apparatus embodiment, having a squeeze-actuated valve.

Figure 5A is a top plan view of a oxygen delivery apparatus embodiment, having a hinged lid.

Figure 5B is a side plan view of a canister for the embodiment of Figure 5A.

Figure 5C is a front plan view of the embodiment of Figure 5A.

Figure 5D is a side plan view of the embodiment of Figure 5A.

Figure 5E is a rear plan view of the embodiment of Figure 5A.

Figure 5F is a bottom plan view of the embodiment of Figure 5A.

Figure 6A is a side plan view of a oxygen delivery apparatus embodiment, having a hinged lid and two canisters.

Figure 6B is a top plan view of the embodiment of Figure 6A.

Figure 6C is a front plan view of the embodiment of Figure 6A.

Figure 6D is a side plan view of the embodiment of Figure 6A.

Figure 6E is a rear plan view of the embodiment of Figure 6A.

Figure 6F is a bottom plan view of the embodiment of Figure 6A.

DETAILED DESCRIPTION OF THE INVENTION

Figs. 1A-1B depict one embodiment of an oxygen delivery apparatus 10. This oxygen delivery apparatus 10 comprises a canister 12, a tubular mouthpiece 14, and a valve 16.

The canister 12 may be any device capable of storing oxygen under pressure and should have a port assembly 18 at one end (not shown) for charging and/or discharging the canister 12. The port assembly 18 may include a spring loaded valve (not shown) that automatically prevents oxygen from flowing through the port assembly 18 when the canister 12 is not engaged with the valve 16. The canister 12 is preferably constructed from sturdy yet lightweight materials, such as molded plastic, aluminum, fiberglass, or a combination thereof.

In the embodiment shown in Fig. 1, the canister 12 has a generally cylindrical shape. This cylinder is between about two and four inches in length, between about one-half inch and two inches in diameter, and has a capacity of between about three and eight grams of gas. Accordingly, this canister 12 embodiment can provide between about 50 and 250 individual

uses or between about 1 and 10 minutes of continuous gas flow. These embodiments are desirable because the canister 12 provides a reasonable storage capacity, but can be still easily held in the user's hand. However, canisters 12 having other shapes, sizes, and capacities are within the scope of the present invention. These shapes, sizes and capacities may be optimized for a particular use. For example, canisters 12 designed to be carried by runners should normally be smaller and lighter than those designed for use by truckers.

The mouthpiece 14 in Figs. 1A-1B comprises an "L" shaped hollow tube 21. The tube 21 has a generally circular opening 22 at one end thereof for insertion within the user's mouth. The opposite end 24 of the tube 21 is shaped and sized to receive the canister 12. In some embodiments, such as that shown in Figs. 2A-2B, the mouthpiece 14 also comprises a removable mouth and nose piece ("mask") 26. This mask is operatively attached to the opening 22 and adapted to sealably engage with the user's nose and mouth region or to abut the adjoining regions so that a significant portion of the released oxygen is inhaled by the user.

The valve 16 can be any device that allows the user to selectively discharge the pressurized oxygen from the canister 12. In some embodiments, such as those shown in Figs. 1A-1B and 2A-2B, the user actuates the valve 16 by pushing the canister 12 into the mouthpiece 14. These embodiments may be adapted to continuously deliver oxygen as long as the user continues to squeeze the canister 12 or may be adapted to deliver one metered dose each time the canister 12 and the mouthpiece 14 are compressed together. The valve 16 or the canister 12 may also include a return spring or check valve (not shown) designed to stop the flow of oxygen when the user releases the canister 12. In addition, the valve 16 or the canister 12 may include a pressure relief valve designed to controllably release the oxygen if the pressure

differential between the interior of the canister 12 and exterior of the canister 12 exceeds a preselected value.

The valve 16 and the mouthpiece 14 in some embodiments comprise a non-friction or low-friction material, such as plastic, and are designed to provide smooth gas-flow passageway. These embodiments are desirable because the non-friction design and materials can help reduce any heating effects caused by the release of the pressurized oxygen.

As noted in Appendix A, atmospheric conditions include 21% oxygen, 78% nitrogen and traces of other gases. Thus, it is possible to combine higher levels of oxygen with non-combustible or inert materials like nitrogen to obtain the benefits of an enriched oxygen mixture without the attendant difficulties of pure or nearly pure oxygen, for example 30% oxygen and 70% nitrogen or even higher concentrations of oxygen.

In some embodiments, the canister 12 is removably attached to the valve 16. Accordingly, the canister 12 in these embodiments may be to be either refilled, or disposed of and replaced, when empty. In a one embodiment, the valve 16 and mouthpiece 14 slide over the port assembly 18 and compressibly engage the canister 12. In an alternative embodiment, mouthpiece 14 and the valve 16 threadably engage the canister 12.

Fig. 3 shows an alternate embodiment of the present invention in which the canister 12 and the mouthpiece 14 are substantially coaxial. In this embodiment, the user actuates the valve 16 by first gripping the canister 12 and then pushing the canister 12 into the mouthpiece 14. The mouthpiece 14 in this embodiment may be used with or without the removable mask 26 described with reference to Fig. 2. These embodiments may be desirable because the same force used to actuate the valve 16 also holds the mask 26 against the user's mouth and nose.

These embodiments may also be desirable because the oxygen delivery apparatus 10 may be disguised as another generally cylindrical object, such as a pen, a relay baton, a walking stick, or a cane.

Fig. 4 shows an alternate embodiment of the present invention in which the mouthpiece 14 comprises a flexible portion 30. The user actuates the valve 16 in this embodiment by squeezing a portion of the flexible portion 30 radially inward. These embodiments may be desirable because the valve 16 design may prevent accidental activation.

Figs. 5A-5F show an alternate embodiment of the present invention having a hinged lid 32 at the opposite end 24 from the mouthpiece 14. The mouthpiece 14 comprises an "L" shaped hollow tube 21. Unlike the circular opening of the embodiment of Figs. 1A-1B, the tube 21 in Figs. 5A-5F has a generally ovular opening 22 at one end thereof for insertion within the user's mouth. The opposite end 24 of the tube 21 has a square outer configuration and is shaped and sized to receive the canister 12. The user actuates the valve 16 by pushing the hinged lid 32 down onto the canister 12.

Figs. 6A-6F show an alternate embodiment of the present invention having two canisters 12, 34 and a hinged lid 32. Like the embodiment of Figs. 5A-5F, the mouthpiece comprises an "L" shaped hollow tube 21, and the tube 21 has a generally ovular opening 22 at one end. Unlike the embodiment of Figs. 5A-5F, the opposite end 24 of the tube 21 is shaped and sized to receive two canisters 12, 34. The first canister 12 is located adjacent to the mouthpiece 14 and the valve 16 of the first canister 12 is actuated by pressing the hinged lid 32 down onto the canister 12, which forces the canister 12 against the mouthpiece 14, causing the

release of oxygen. The pressurized canister 12 and the spring-loaded valve 16 regulate the amount of oxygen released.

The second canister 34 in Figs. 6A-6F is the spare canister and is located next to the first canister 12 and opposite the ovular opening 22 in the mouthpiece 14. When the first canister 12 is empty, the second canister 34 can be moved into place adjacent to the mouthpiece for actuation. The oxygen delivery device of Figs. 6A-6F may range in size from 50 to 250 mg, and will deliver 40 to 200 mcg of oxygen per actuation to the user.

Although the present invention has been described in detail with reference to certain examples thereof, it may be also embodied in other specific forms without departing from the essential spirit or attributes thereof. For example, the present invention may include a strap which is removably attached to the oxygen delivery apparatus 10. This strap allows the device to hang from the user's neck, wrist, or clothing. The strap may also contain a grounding wire designed to prevent electrostatic discharges near the oxygen delivery apparatus 10. The present invention may also include a mounting means so that the oxygen delivery apparatus 10 can be removably attached to a surface. In addition, the canister 12, the valve 16, the mouthpiece 14, and the mask 26, or a sub-combination thereof, may be integrally formed from a single piece of material. These embodiments may be desirable because the oxygen delivery apparatus 10 would require fewer parts.

Those skilled in the art will recognize that the accompanying figures and this description depicted and described embodiments of the present invention, and features and components thereof. With regard to means for fastening, mounting, attaching or connecting the components of the present invention to form the mechanism as a whole, unless specifically described

otherwise, such means were intended to encompass conventional fasteners such as machine screws, nut and bolt connectors, machine threaded connectors, snap rings, screw clamps, rivets, nuts and bolts, toggles, pins and the like. Components may also be connected by welding, friction fitting, adhesives, or deformation, if appropriate. Unless specifically otherwise disclosed or taught, materials for making components of the present invention were selected from appropriate materials, such as metal, metallic alloys, fibers, polymers and the like, and appropriate manufacturing or production methods including casting, extruding, molding and machining may be used. In addition, any references to front and back, right and left, top and bottom and upper and lower were intended for convenience of description, not to limit the present invention or its components to any one positional or spacial orientation. Therefore, it is desired that the embodiments described herein be considered in all respects as illustrative, not restrictive, and that reference be made to the appended claims for determining the scope of the invention. Having described my invention,

CLAIMS

I claim:

1. A portable oxygen delivery apparatus, comprising:

a) a canister adapted to store pressurized oxygen;

b) a mouthpiece; and

c) a valve operably connected to the canister and to the mouthpiece, wherein the valve selectively permits oxygen to flow from the canister to the mouthpiece.

2. The apparatus of claim 1, wherein the canister is removably attached to the valve.

3. The apparatus of claim 2, wherein the canister is refillable.

4. The apparatus of claim 1, wherein the apparatus is transportable in a pocket of conventional clothing without enlargement or other modifications to the pockets.

5. The apparatus of claim 1, wherein the apparatus is transportable in a pocket of conventional clothing without disassembly or other modifications to the apparatus.

6. The apparatus of claim 1, wherein the canister, the mouthpiece, and the valve are adapted to be hand-held.

7. The apparatus of claim 1, wherein the canister has a length of between two inches and four inches.

8. The apparatus of claim 1, wherein the canister has a length of at least two inches.

9. The apparatus of claim 1, wherein the canister has a length of four inches or less.

10. The apparatus of claim 1, wherein the canister has a diameter of between one and a half inches and two inches.

11. The apparatus of claim 1, wherein the canister has a diameter of at least one and a half inches.

12. The apparatus of claim 1, wherein the canister has a diameter of two inches or less.

13. The apparatus of claim 1, wherein the canister has a capacity of between three grams of gas and eight grams of gas.

14. The apparatus of claim 1, wherein the canister has a capacity of at least three grams of gas.

15. The apparatus of claim 1, wherein the canister has a capacity of eight grams of gas or less.

16. The apparatus of claim 1, further comprising a removable mask operably attached to the mouthpiece.

17. The apparatus of claim 1, wherein the mouthpiece is integrally formed as part of the canister, and wherein oxygen is released upon application of radial force to the canister.

18. The apparatus of claim 1, wherein the canister and the mouthpiece are substantially coaxial.

19. The apparatus of claim 1, wherein the valve is adapted to provide one metered supply of oxygen when actuated.

20. The apparatus of claim 1, wherein the valve has a spring element, the spring element being biased to close the valve and wherein the valved is opened when a force is applied to one of the canister, the mouthpiece or the valve in opposition to the bias.

21. The apparatus of claim 1, wherein the valve is adapted to provide a substantially continuous supply of oxygen when actuated.

22. The apparatus of claim 1, wherein the pressurized oxygen is an oxygen mixture of oxygen combined with one or more other non-combustible gases.

23. The apparatus of claim 22, wherein the oxygen mixture is pressurized to a pressure greater than the surrounding atmospheric pressure.

24. The apparatus of claim 22, wherein the oxygen mixture is pressurized to a pressure greater than 20 psi.

25. The apparatus of claim 22, wherein the oxygen mixture is pressurized to a pressure less than 50 psi.

26. The apparatus of claim 1, further comprising a hinged element pivotably connected to an end of the mouthpiece.

27. The apparatus of claim 26, wherein the valve is actuated by pressing the hinged element toward the canister.

28. A handheld oxygen delivery apparatus, comprising:

a) a canister housing defining a canister chamber;

b) a pressurized oxygen canister received within the canister housing;

c) a mouthpiece in communication with the canister chamber;

d) a valve operably connected to the pressurized oxygen canister and to the mouthpiece, wherein the valve selectively permits oxygen to flow from the pressurized oxygen canister to the mouthpiece.

29. The apparatus of claim 28, further comprising a second pressurized oxygen canister received in the canister housing.

30. The apparatus of claim 28, wherein the canister is removably attached to the valve.

31. The apparatus of claim 28, wherein the valve is actuated by biasing the pressurized oxygen canister with respect to the mouthpiece and whereby oxygen is released when pressure is applied in opposition to the bias.

32. The apparatus of claim 1, wherein the pressurized oxygen canister is a disposable element.

33. The apparatus of claim 28, wherein the pressurized oxygen canister is a disposable element.

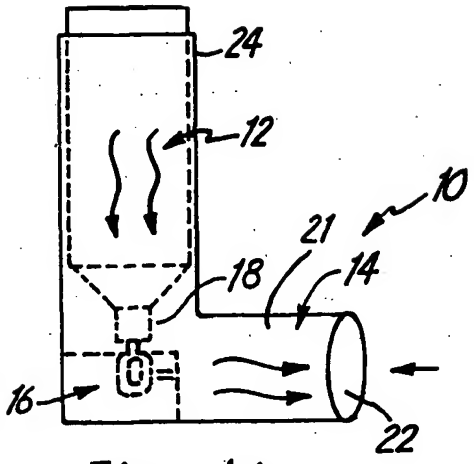


FIG. 1A

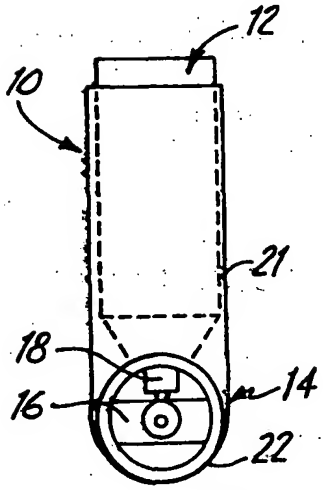


FIG. 1B

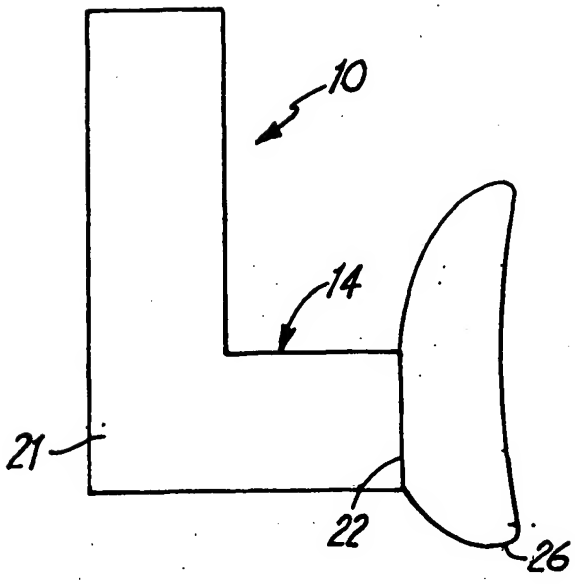


FIG. 2A

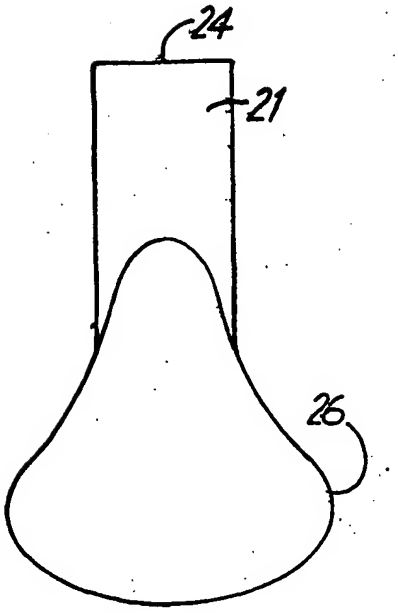


FIG. 2B

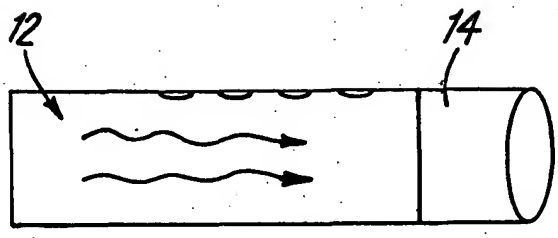


FIG. 3A

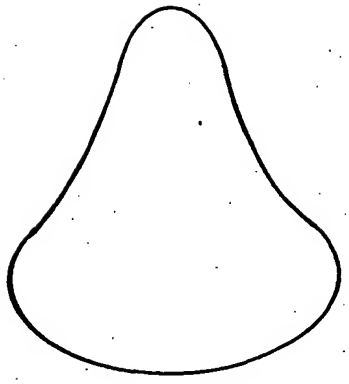
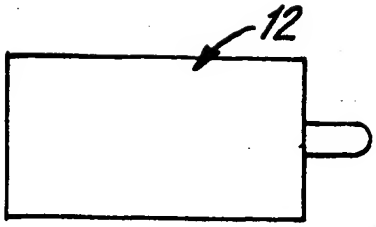


FIG. 3B



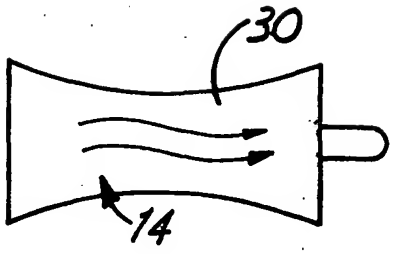


FIG. 4

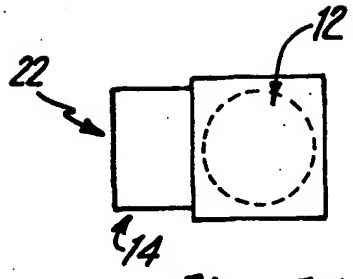


FIG. 5A

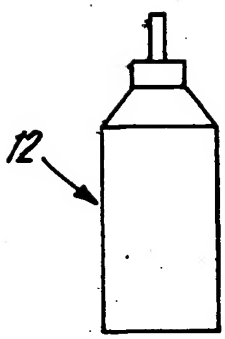


FIG. 5B

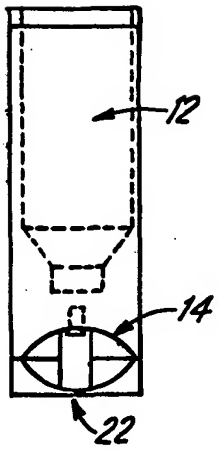


FIG. 5C

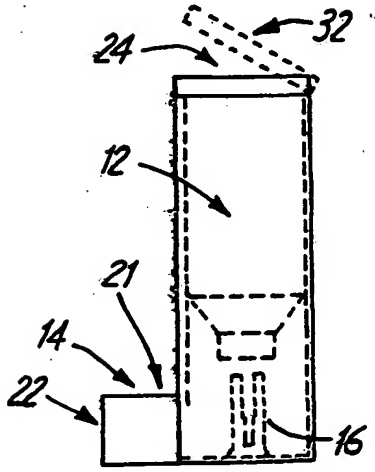


FIG. 5D

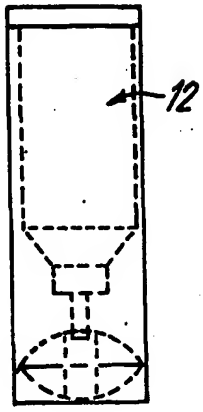


FIG. 5E

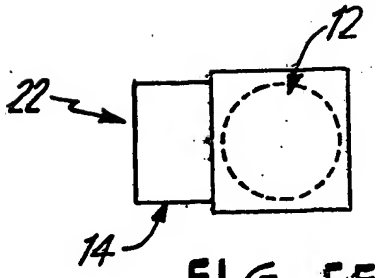


FIG. 5F

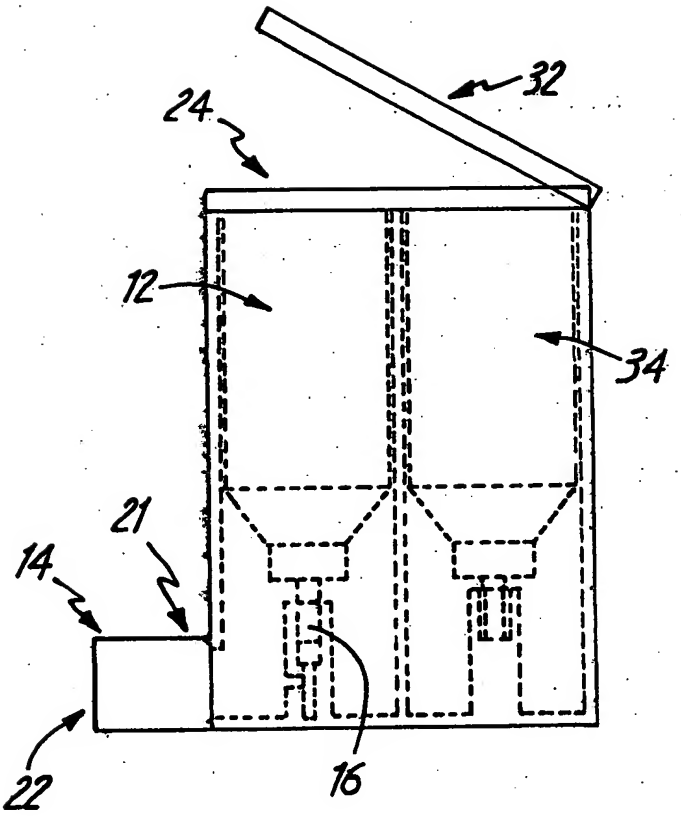


FIG. 6A

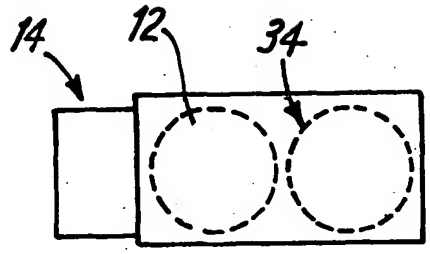


FIG. 6B

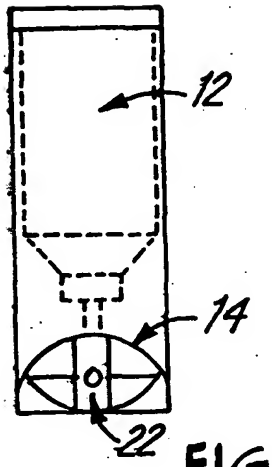


FIG. 6C

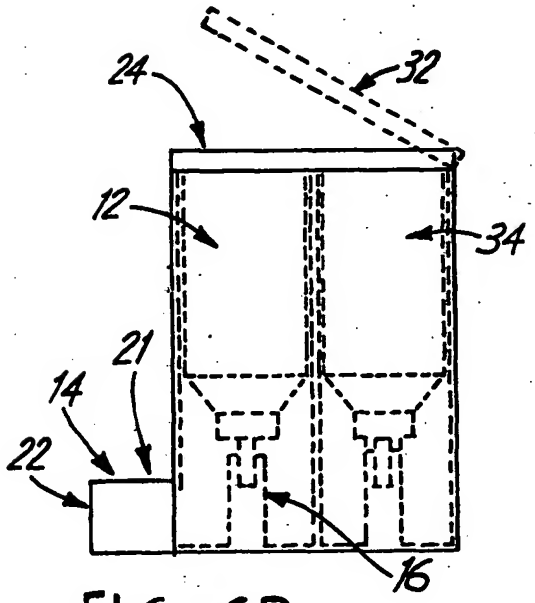


FIG. 6D

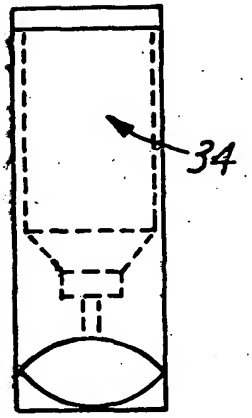


FIG. 6E

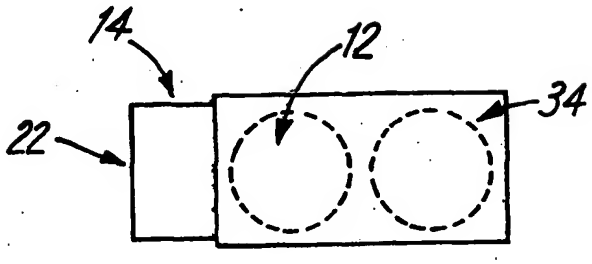


FIG. 6F

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/00522

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :Please See Extra Sheet.
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 128/200.23, 200.12, 200.14, 200.21, 201.28, 203.12, 203.15, 203.23

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,535,735 A (McPherson) 16 July 1996, see Fig. 4; col. 3, lines 41-64; col. 4, lines 59-65.	1, 2, 4-6, 17-18,20,21,28,30-33
— Y		3,7-15
Y	US 5,483,953 A (Cooper) 16 January 1996, see Fig. 8; col. 10, lines 51-63.	16
Y	US 5,447,150 A (Bacon) 5 September 1995, see Fig. 1; col. 1, lines 7-9; col. 4, lines 8-15.	19, 26, 27
Y, P	US 6,125,844 A (Samoites) 3 October 2000, col. 1, lines 6-10.	22-25
Y	US 5,007,419 A (Weinstein et al) 16 April 1991, see Fig. 1	29

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 01 MARCH 2001	Date of mailing of the international search report 17 APR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer DARWIN P. EREZO Telephone No. (703) 305-3001

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/00522

A. CLASSIFICATION OF SUBJECT MATTER:
IPC (7):

A61M 11/00, 15/00, 15/08, 16/00, 16/10; A62B 18/10; B05D 7/14; B65D 83/06

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

128/200.23, 200.12, 200.14, 200.21, 201.28, 203.12, 203.15, 203.23